Amendments to the Claims

The current listing of the claims replaces all previous amendments and listings of the claims.

1.-10. (Canceled)

11. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase PM type including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an inner circumference of said rotor and in a rotating direction of said rotor in which a number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body directly mounted on said rotor to directly drive a load that contacts an outer circumference thereof,

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

12. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase VR type including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an inner circumference thereof in which a number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body directly mounted on said rotor to directly drive a load that contacts an outer circumference thereof,

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

13. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an inner circumference of said rotor and in a rotating direction of said rotor in which a number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body mounted on said rotor through an output portion of a reduction gear to directly drive a load that contacts an outer circumference thereof,

wherein a rotation axis of said output portion is concentric with a rotation axis of said rotational electric machine, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

14. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase VR type including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an inner circumference thereof in which a number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body mounted on said rotor through an output portion of a reduction gear to directly drive a load that contacts an outer circumference thereof,

wherein a rotation axis of said output portion is concentric with a rotation axis of said rotational electric machine, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

15. (Previously Presented) The motor-driven system according to one of Claims 11 to 14, wherein said stator has a 3-phase winding structure.

16. (Previously Presented) The motor-driven system according to one of Claims 11 to 14, wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping.

17. (Previously Presented) The motor-driven system according to one of Claims 11 to 14, wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

18. (Previously Presented) The motor-driven system according to one of Claims 11 to 14, wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

19. (Previously Presented) The motor-driven system according to one of Claims 11 to 14, wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

20. (Previously Presented) The motor-driven system according to Claim 19, wherein the value of γ is equal to 90° (γ-90°) in terms of electrical angle.

21. (Previously Presented) The motor-driven system according to Claim 19, wherein the value of γ is in a range of $0 < \gamma \leq 90°$ and said motor is driven as an open loop stepping motor.

22. (Previously Presented) The motor-driven system according to Claim 19, wherein the value of γ satisfies $\gamma > 90°$ and said motor is driven as a closed loop blushless motor.

23. (Currently Amended) A motor-driven system comprising:

a rotational electric machine <u>of a 3-phase PM type</u> including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor <u>in which a number of rotor poles is 2P</u>, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

24. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase VR type including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof in which a number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

25. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping.

26. (Currently Amended) A motor-driven system comprising:

a rotational electric machine <u>of a 3-phase PM type</u> including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor <u>in which a number of rotor poles in 2P</u>, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

27. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase VR type including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof in which a number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

28. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and

inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

29. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase PM type including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor in which a number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

30. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase VR type including,

a stator having an annular magnetic substance, main poles ~~provided~~ extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof in which a number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

31. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor in which a number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor, and

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

32. (Currently Amended) A motor-driven system comprising:

a rotational electric machine of a 3-phase VR type including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof in which a number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof, said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a

rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor,

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k (6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1.

33. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein P=m (3n±1) in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or P=k(6n±1) in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

34. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each

constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

35. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m\ (3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

36. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body mounted on said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $p=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

37. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and

inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

38. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

39. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

40. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m\ (3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

41. (Previously Presented) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

42. (Previously Presented) The motor-driven system according to one of Claims 31, 32, 35, 36, 40 and 41, wherein the value of γ is equal to 90° (γ=90°) in terms of electrical angle.

43. (Previously Presented) The motor-driven system according to one of Claims 31, 32, 35, 36, 40 and 41, wherein the value of γ is in a range of $0<\gamma<\_90°$ and said motor is driven as an open loop stepping motor.

44. (Previously Presented) The motor-driven system according to one of Claims 31, 32, 35, 36, 40 and 41, wherein the value of γ satisfies $\gamma>90°$ and said motor is driven as a closed loop blushless motor.